PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of	Docket No: Q77338
Byung-cheol SONG, et al.	
Appln. No.: 10/687,589	Group Art Unit: 2621
Confirmation No.: 2529	Examiner: RAO, ANAND SHASHIKANT
Filed: October 20, 2003	

For: METHOD AND APPARATUS FOR ENCODING VIDEO SIGNAL WITH VARIABLE BIT RATE

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

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I.   REAL PARTY IN INTEREST

The real party in interest is the Assignee, Samsung Electronics Co. Ltd., by virtue of an

assignment recorded in the U.S. Patent and Trademark Office on October 20, 2003 at Reel

014627, Frame 0212.

II.   RELATED APPEALS AND INTERFERENCES

There are no other appeals, judicial proceedings, or interferences known to the Appellant,

Appellant's legal representative, or the Assignee, which may be related to, directly affected by,

or have a bearing on the Board's decision in the pending appeal.

III.   STATUS OF CLAIMS

Claims 1-7 are all of the claims pending in the application. Following entry of an Amendment Under 37 C.F.R. § 1.116, filed February 20, 2007, claim 3 is allowed.

Accordingly, Claims 1-2 and 4-7 are the subject of this appeal. Claims 1-2 and 4 stand finally rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,570,922 to Wang et al. (hereinafter "Wang"). Claims 5-7 stand finally rejected under 35 U.S.C. § 103(a) as being unpatentable over Wang in view of U.S. Patent No. 6,595,042 to Liu et al. (hereinafter "Liu").

All of the claims are set forth in the attached Appendix.

IV.   STATUS OF AMENDMENTS

In the Final Office Action dated October 19, 2006, the Examiner, *inter alia*, objected to

claim 3 as being dependent upon a rejected base claim, but that it would be allowable if rewritten

in independent form. An Amendment Under 37 C.F.R. § 1.116 was filed on February 20, 2007

concurrent with the filing of a Notice of Appeal in this case. The only amendment in the

February 20, 2007 Amendment was to rewrite claim 3 into independent form. The Advisory

Action, mailed April April 17, 2007, indicates that the February 20, 2007 Amendment will be

entered for purposes of appeal.

V.   SUMMARY OF THE CLAIMED SUBJECT MATTER

Claim 1 is directed to a method for encoding a video signal with a variable bit rate. (See pages 9-14, paragraphs 36-47)

The claimed method comprises:[1]

(a) calculating a complexity for each of a plurality of pictures on the basis of a bit amount and a quantization parameter of a previous frame; (Fig. 4, #410, paragraphs 38, 47)

(b) calculating a remaining bit amount for each picture in proportion to the complexity for each picture calculated in (a); (Fig. 4, #430, paragraph 40).

(c) calculating a quantization parameter of a current frame on the basis of the complexity for each picture and the remaining bit amount for each picture calculated in (b); (Fig. 4, #440, paragraphs 42-45) and

(d) comparing the quantization parameter of the current frame calculated in (c) with a predetermined minimum quantization parameter and determining a final quantization parameter. (Fig. 4, #460,#470, paragraph 46).

Claim 6 is directed to an apparatus for encoding a video signal. (See pages 7-8, paragraphs 23-30)

The claimed apparatus comprises:[2]

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[1] See Fig. 4 and specification pages 9-14.

[2] See Fig. 2, and specification pages 7-8.

a discrete cosine transform (DCT) unit (Fig. 2, #220) which performs DCT on input image data in units of macroblocks; (paragraph 25).

a bit rate controller (Fig. 2, #290) which determines a quantization parameter of a current frame, on the basis of a bit amount for each picture and a complexity for each picture generated per frame; (paragraphs 30, 47)

a quantization unit (Fig. 2, #230) which quantizes the image data subjected to DCT by the DCT unit (Fig. 2, #220) according to the quantization parameter determined by the bit rate controller (Fig. 2, #290); (paragraph 26, 30)

a dequantization unit (Fig. 2, #250) which dequantize the image data quantized by the quantization means[3] (Fig. 2, #230); (paragraph 26).

an Inverse Discrete Cosine Transform (IDCT) unit (Fig. 2, #260) which performs IDCT on the image data dequantized by the dequantization unit (Fig. 2, #250); (paragraph 27)

a frame memory (Fig. 2, #270) which stores the image data subjected to IDCT by the IDCT unit (Fig. 2, #260), in units of frames; (paragraph 27) and

a movement estimation and compensation unit (Fig. 2, #280) which estimates a movement vector and a Sum of Absolute Difference (SAD) using image data of an input current frame and image data of an immediately preceding frame stored in the frame memory (Fig. 2, #270), and compensates for movement using the movement vector. (paragraph 28).

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[3] Appellant respectfully notes that there is an error in the phrase "quantization means". The word "means" should be "unit". (see paragraph 26).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. The final rejection of Claims 1 and 4 under 35 U.S.C. § 102(e) as being anticipated by Wang.

B. The final rejection of Claim 2 under 35 U.S.C. § 102(e) as being anticipated by Wang.

C. The final rejection of claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Wang in view of Liu.

D. The final rejection of claims 6-7 under 35 U.S.C. § 103(a) as being unpatentable over Wang in view of Liu.

VII.　ARGUMENT

Appellant respectfully submits that claims 1-2 and 4 are not anticipated by Wang because Want fails to disclose the features of "calculating a quantization parameter of a current frame on the basis of the complexity for each picture and the remaining bit amount for each picture calculated in (b)" and of "comparing the quantization parameter of the current frame calculated in (c) with a predetermined minimum quantization parameter and determining a final quantization parameter".　Appellant further respectfully submits that claim 5 would not have been rendered obvious in view of the Examiner's proposed combination of Wang and Liu because the combination does not teach the feature of "the predetermined minimum quantization parameter is determined to be the final quantization parameter if the quantization parameter of the current frame is smaller than the predetermined minimum quantization parameter, and the quantization parameter of the current frame is determined to be the final quantization parameter if the quantization parameter of the current frame is greater than the predetermined minimum quantization parameter."　Appellant still further respectfully submits that claims 6-7 would not have been rendered obvious in view of the Examiner's proposed combination of Wang and Liu because the combination does not teach the feature of a movement estimation and compensation unit which estimates a movement vector and a Sum of Absolute Difference (SAD) using image data of an input current frame and image data of an immediately preceding frame stored in the frame memory.

I.   CLAIMS 1 AND 4

Claim 1 recites, *inter alia*, the feature of "calculating a quantization parameter of a

current frame on the basis of the complexity for each picture and the remaining bit amount for

each picture calculated in (b)". The Examiner maintains that this feature is met by Wang at col.

28, lines 40-47. (See May 12, 2006 Office Action at page 3). However, Appellant respectfully

disagrees with the Examiner's position.

It is well settled law that "a claim is anticipated only if each and every element as set

forth in the claim is found, either expressly or inherently described, in a single prior art

reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987).

Morevoer, the identical invention must be shown in as complete detail as is claimed in the claim.

Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236 (Fed. Cir. 1989).

In the instant case, Wang, at col. 28, lines 40-47, discloses that transcoders partially

decompress the respective bitstreams, and encode the partially decompressed data at a different

dat rate, typically by using a different quantization parameter. However, Appellant notes that, at

this portion, Wang does not disclose how the quantization parameter is calculated. Indeed,

Wang, at col. 28, lines 47-50, describes that a rate control processor receives information from

the transcoders, including the quantization parameter of the current frame. While the

quantization parameter must be calculated in some way by the transcoders, the specifics of the

calculation are not expressed or suggested by Wang. By contrast, Claim 1 sets forth calculating

the quantization parameter of a current frame on the basis of the complexity for each picture and

the remaining bit amount for each picture calculated in (b). Because this feature is not disclosed

by Wang in any meaningful manner, Appellant respectfully submits that Claim 1 is improperly

finally rejected over Wang.

Moreover, Claim 1 recites the feature of "comparing the quantization parameter of the

current frame calculated in (c) with a predetermined minimum quantization parameter and

determining a final quantization parameter". The Examiner maintains that this feature is met by

Wang at col. 7, lines 48-52. However, Appellant respectfully disagrees with the Examiner's

position.

However, at col. 7, lines 48-52, Wang describes calculating a remaining number of bits,

R, whereby R is assigned a value of R minus the sum of the number of bits required for coding a

given frame n', $t_{n'}$, where n' runs from 0 to n-1. Thus, Wang does not disclose a quantization

parameter, but rather a remaining number of bits. Moreover, Appellant notes that Wang, at other

places of his disclosure, refers specifically to a "quantization parameter" (see, e.g., col. 6, line

64). Therefore, Appellant respectfully submits that the remaining number of bits R cannot

logically correspond to a quantization parameter. Accordingly, Appellant respectfully submits

that Claim 1 is patentable over Wang for this additional reason. Even assuming *arguendo* that

the newly assigned R could somehow correspond to the claimed quantization parameter (which

Appellant argues it does not) as the Examiner maintains, there is no disclosure of comparing the

quantization parameter to a predetermined minimum quantization parameter, as set forth in

Claim 1. Moreover, since there is no predetermined minimum quantization parameter disclosed,

it is logically impossible to determine a final quantization parameter from the comparison, as

also set forth by Claim 1.

In the Final Office Action, the Examiner responds to Appellant's arguments. (See October 19, 2006 Final Office Action at page 2). The Examiner argues that since rate information is updated, the quantization parameters assigned are changed to a determined final quantization parameter in accordance with a finally updated rate value, and cites to Wang at col. 28, lines 45-52 for support for this position. However, as discussed above, to reject a claim under § 102, the identical invention must be shown by the reference in as complete detail as is claimed. In the instant case, even if rate information is updated and a final quantization parameter is determined, as maintained by the Examiner, Wang still does not disclose comparing the quantization parameter with a predetermined minimum quantization parameter, as recited by Claim 1.

The Examiner also argues that Wang discloses that "the quantization parameters are processed" in order to set the target bit rates to converge within a small margin, and that this disclosure meets the claimed comparison to a minimum quantization parameter, and cites Wang at col. 29, lines 10-15 as support for this position. However, Appellant respectfully disagrees with the Examiner's stated position.

First, col. 29, lines 10-15 of Wang disclose only that *target rates* will converge, not that a quantization parameter will converge. Even so, the mere convergence to some specific value does not, per se, correspond to comparing a quantization parameter to a predetermined minimum quantization parameter, as recited by Claim 1. An value may converge to any set value, for example a minimum, a maximum, or may be tied to an arbitrary threshold. In the instant case, Wang does not disclose the specific feature of comparing a quantization parameter of a current

frame to a predetermined minimum quantization parameter, as recited by Claim 1. Claim 1 is thus patentable over Wang for this additional reason.

Claim 4 depends from Claim 1. Accordingly, Appellant respectfully submits that Claim 4 is patentable over Wang based on its dependency.

Thus, in summary, Appellant respectfully submits that the final rejection of Claims 1 and 4 under 35 U.S.C. § 102(e) over Wang is improper for the above-stated reasons, and respectfully requests that the rejection be withdrawn and Claims 1 and 4 be allowed.

II.   CLAIM 2

Claim 2 depends from Claim 1, and accordingly recites the identical features argued above as being patentable over Wang. Accordingly, Appellant respectfully submits that the final rejection of Claim 2 under 35 U.S.C. § 102(e) over Wang is improper for same reasons discussed above with respect to Claim 1.

Moreover, Claim 2 recites the feature "wherein the remaining bit amount for each picture is obtained by multiplying the complexity for each picture by a total bit amount of remaining frames for each picture". The Examiner maintains that this feature is disclosed by Wang at col. 7, lines 30-65. (See May 12, 2006 Office Action at page 3). However, Appellant respectfully disagrees with the Examiner's position.

At the cited portion of Wang, and specifically at col. 7, equation (7), Wang discloses that a remaining bit amount R is calculated by subtracting from a previous remaining bit amount, a total number of bits $T_{n'}$ required for coding frame n'. Accordingly, Appellant respectfully submits that Wang does not disclose calculating a remaining bit amount from each picture by

multiplying the complexity for each picture by a total bit amount of remaining frames for each

picture, as recited by Claim 2.   Appellant respectfully submits that Claim 2 is patentable over

Wang for this additional reason.

In summary, Appellant respectfully submits that the final rejection of Claim 2 under 35

U.S.C. § 102(e) over Wang is improper for the above-stated reasons, and respectfully requests

that the rejection be withdrawn and Claim 2 allowed.

III.   CLAIM 5

Claim 5 recites the feature wherein "the predetermined minimum quantization parameter

is determined to be the final quantization parameter if the quantization parameter of the current

frame is smaller than the predetermined minimum quantization parameter, and the quantization

parameter of the current frame is determined to be the final quantization parameter if the

quantization parameter of the current frame is greater than the predetermined minimum

quantization parameter." The Examiner acknowledges that Wang does not teach this feature, but

cites Liu at col. 14, lines 45-67 as allegedly curing the deficiency. The Examiner further

maintains that one of ordinary skill in the art would have been motivated to substitute the

teachings of Liu into the method of Wang in order to account for detected scene changes in the

coded video data. However, Appellant respectfully disagrees with the Examiner's position.

First, as discussed in detail above, Wang does not disclose a minimum quantization

parameter, much less the claimed comparison. Accordingly, there is no teaching or suggestion in

the prior art as to how one having ordinary skill in the art would accomplish the Examiner's

proposed modification.

Second, at the cited portion of Liu (col. 14, lines 45-67), Liu discusses the uses of the complexity measure. The complexity measure may be summed over all macroblocks for a given video frame. Under constant bit rate operation, the complexity measure may be used to estimate the average quantization step size needed for a given bit-budget. Under variable bit rate operation, the complexity measure may be used to predict bits needed to encode a certain video frame to maintain quality. However, Applicant respectfully submits that this teaching of Liu does not relate to how the final quantization parameter is determined. More specifically, Liu does not teach or otherwise show that "the predetermined minimum quantization parameter is determined to be the final quantization parameter if the quantization parameter of the current frame is smaller than the predetermined minimum quantization parameter, and the quantization parameter of the current frame is determined to be the final quantization parameter if the quantization parameter of the current frame is greater than the predetermined minimum quantization parameter", as recited by claim 5. Accordingly, since Liu does not cure the acknowledged deficiencies of Wang in this regard, Appellant respectively submits that Claim 5 is patentable for these reasons, and that the final rejection of Claim 5 under 35 U.S.C. § 103(a) over Wang in view of Liu is thus improper.

IV.   CLAIMS 6 AND 7

Claim 6 recites the feature of a movement estimation and compensation unit which estimates a movement vector and a Sum of Absolute Difference (SAD) using image data of an input current frame and image data of an immediately preceding frame stored in the frame memory. The Examiner acknowledges that Wang does not disclose this feature, but cites the

teachings of Liu at Fig. 4, element 168 and col. 6, lines 4-15 as allegedly curing this deficiency.

However, Appellant respectfully disagrees with the Examiner's position.

In Fig. 4, Liu shows element 168 as a motion compensation. See col. 6, lines 9 and 17-19.

However, at col. 6, lines 9 and 17-19, Liu only generally describes the motion compensation 168

as using an "iterative process" to reconstruct frames using a framestore memory 170. Thus, at

this portion, Liu does not disclose calculating a movement vector or a Sum of Absolute

Difference (SAD). Appellant notes that at col. 6, lines 26-38, Liu does discuss a motion

estimation 186 element in the re-encoding section of Fig. 6. Moreover, Liu discusses generating

motion vectors on a frame by frame basis using a framestore memory 184. Liu also discusses

summing a predicted picture with a next decoded picture and encoding the result. See col. 6,

lines 31-34. However, Liu does not disclose or teach a Sum of the Absolute Difference (SAD).

Therefore, for these reasons, Applicant respectfully submits that claim 6 is patentable over the

Wang and Liu combination, and accordingly the § 103 final rejection of claim 6 over Wang and

Liu is improper.

Claim 7 depends from Claim 6. Accordingly, Appellant respectfully submits that Claim

7 is patentable over the Wang and Liu combination by virtue of its dependencies, and thus the

final rejection of Claim 7 under 35 U.S.C. § 103 is improper.

V.   CONCLUSION

Unless a check is submitted herewith for the fee required under 37 C.F.R. §41.37(a) and

1.17(c), please charge said fee to Deposit Account No. 19-4880.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: April 20, 2007

CLAIMS APPENDIX

CLAIMS 1-2 and 4-7 ON APPEAL:

1.   A method for encoding a video signal with a variable bit rate, the method comprising:

(a) calculating a complexity for each of a plurality of pictures on the basis of a bit amount and a quantization parameter of a previous frame;

(b) calculating a remaining bit amount for each picture in proportion to the complexity for each picture calculated in (a);

(c) calculating a quantization parameter of a current frame on the basis of the complexity for each picture and the remaining bit amount for each picture calculated in (b); and

(d) comparing the quantization parameter of the current frame calculated in (c) with a predetermined minimum quantization parameter and determining a final quantization parameter.

2.   The method of claim 1, wherein the remaining bit amount for each picture is obtained by multiplying the complexity for each picture by a total bit amount of remaining frames for each picture.

4.   The method of claim 1, wherein the quantization parameter of the current frame is obtained by dividing an average complexity for each picture by the remaining bit amount for each picture.

5.   The method of claim 1, wherein in determining the final quantization parameter, the predetermined minimum quantization parameter is determined to be the final quantization parameter if the quantization parameter of the current frame is smaller than the predetermined minimum quantization parameter, and the quantization parameter of the current frame is determined to be the final quantization parameter if the quantization parameter of the current frame is greater than the predetermined minimum quantization parameter.

6.   An apparatus for encoding a video signal, the apparatus comprising:

a discrete cosine transform (DCT) unit which performs DCT on input image data in units of macroblocks;

a bit rate controller which determines a quantization parameter of a current frame, on the basis of a bit amount for each picture and a complexity for each picture generated per frame;

a quantization unit which quantizes the image data subjected to DCT by the DCT unit according to the quantization parameter determined by the bit rate controller;

a dequantization unit which dequantize the image data quantized by the quantization means;

an Inverse Discrete Cosine Transform (IDCT) unit which performs IDCT on the image data dequantized by the dequantization unit;

a frame memory which stores the image data subjected to IDCT by the IDCT unit, in units of frames; and

a movement estimation and compensation unit which estimates a movement vector and a Sum of Absolute Difference (SAD) using image data of an input current frame and image data of an immediately preceding frame stored in the frame memory, and compensates for movement using the movement vector.

7.   The apparatus of claim 6, wherein the bit rate controller comprises:

a complexity calculator which calculates the complexity for each picture on the basis of the bit amount of each frame in the picture and the quantization parameters;

a remaining bit amount calculator which calculates a remaining bit amount for each picture in proportion to the complexity calculated by the complexity calculator; and

a quantization parameter determination unit which determines the quantization parameter on the basis of the complexity for each picture and the remaining bit amount for each picture calculated by the complexity calculator and the remaining bit amount calculator.

EVIDENCE APPENDIX:

There has been no evidence submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 or

any other similar evidence.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings.

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MAIL STOP APPEAL BRIEF - PATENTS
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Sir:

        Submitted herewith please find an Appeal Brief. The statutory fee of $500.00 is being
charged to Deposit Account No. 19-4880 via EFS-Web Payment screen.   The USPTO is
directed and authorized to charge all required fees, except for the Issue Fee and the Publication
Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit
Account. A duplicate copy of this paper is attached.

                                        Respectfully submitted,

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